

Diagnosing Diabetic Ketoacidosis (DKA)

Oct 31, 2016 | 0

| ★★★★★

| [emergency](#), [endocrinology](#), [onthepods](#), [paediatrics](#)

Summary Writer: Nicholas Malouf

Editor: James Edwards

Interviewee: Barbara Depczynski

James talks to Dr Barbara Depczynski about diagnosing DKA.

Barbara Depczynski is a senior staff specialist in endocrinology at Prince of Wales Hospital. Barbara's major interests are type 2 diabetes, inpatient diabetes management, pituitary disease and PCOS. Barbara Depczynski serves on ACI In Hospital Diabetes Management Working Group. She is involved with both under graduate and post graduate teaching.

Diagnosing Diabetic Ketoacidosis (DKA)

With Dr Barbara Depczynski, Senior Staff Specialist in Department of Endocrinology at Prince of Wales Hospital, New South Wales, Australia

Introduction

Diabetic Ketoacidosis (DKA) is the triad of ketosis, metabolic acidosis and hyperglycaemia. DKA occurs secondary to an absolute lack of insulin action (and low insulin-to-glucagon ratio). This allows unrestrained gluconeogenesis and ketogenesis. The resultant hyperglycaemia induces an osmotic diuresis (leading to dehydration and electrolyte losses) and the production of ketone bodies creates a high anion gap metabolic acidosis. The *diagnosis* of DKA is biochemical. By definition pH must be <7.3 and ketones must be present. Of course, in most cases BSL is elevated (>20) however there is a euglycaemic form of DKA. There is a textbook clinical picture of dehydration, Kussmaul (deep, laboured) breathing, and abdominal pain.

DKA is distinguished from Hyperosmolar Hyperglycaemic State (HHS), formerly Hyperosmolar Non-ketotic coma, is where there is relative (not absolute) lack of insulin action. In HHS, osmotic diuresis does occur, however, there is enough insulin activity to suppress lipolysis and ketogenesis. Dehydration often develops over a longer period of time in HHS.

Case - 52 year-old male comes to the ward from ED with renal colic secondary to a calculus. His past medical history indicates type 2 diabetes requiring basal Lantus and tds bolus Novorapid. He has been made NBM in preparation for surgery and all insulin has been withheld. On the morning of surgery his BSL is 21.



1. What is your approach to this patient with hyperglycaemia?

- Identify the cause of hyperglycaemia

- usual insulin has been withheld
 - patient is unwell with increased insulin requirements
- Determine if patient is at risk of metabolic decompensation
 - observations: in particular HR, BP and level of consciousness
 - ketone level (capillary or urinalysis)
- More information regarding history of diabetes
 - insulin doses
 - how long they have had diabetes and been insulin-dependent
 - previous DKA
 - glycaemic control in community
- DKA is possible in type 2 diabetics
 - T2DM is a combination of insulin resistance and impaired secretory capacity
 - at time of diagnosis 50% of insulin secretory capacity has been lost already (on average) and this continues to decline with time
 - some patients labeled with T2DM will have latent autoimmune diabetes of adulthood (aka type 1.5 diabetes)
 - more likely to occur in patients already requiring both basal and bolus insulin
 - can occur in patients with little or no insulin requirement in the context of severe intercurrent illness (eg severe pneumonia, ischaemic gut, AMI)

2. What are some common precipitants of hyperglycaemia on the ward?

- Medications - glucocorticoids, octreotide
- Omission/withheld insulin or oral hypoglycaemic agents
- TPN
- IV fluids containing glucose with no change to glycaemic control regime

3. What is the typical appearance of a patient with DKA?

- Clinically dehydrated/hypovolaemic
- remember that urine output may be high due to osmotic diuresis
- Elevated respiratory rate (Kussmaul's breathing to compensate for metabolic acidosis)
- Acetone smell of breath
- Abdominal discomfort

4. What initial investigations would you order?

- BSL
- Ketone level
 - measured at the bedside either by capillary device (not universally available) or by urine dipstick
- VBG
 - pH
 - K⁺
 - anion gap

The patient has hyperglycemia, ketonuria, ketonaemia and a metabolic acidosis.

5. What are your priorities in managing this patient?

- There are three immediate goals in management of DKA
 - Fluid resuscitation with normal saline
 - Electrolyte management
 - although initially often hyperkalaemic, most patients will have total body potassium deficit which will need replacement
 - Switch off ketosis
 - first make sure potassium level is normal or higher, then give insulin
 - if potassium is low when insulin is commenced, it may drop further and precipitate an arrhythmia
- Also important to track ketones and BSL throughout

6. How do you decide on the route and dosing of insulin?

- This is a clinical decision and JMOs ought to involve a senior colleague
- Consult local policy and guidelines - most hospitals have a weight-based regime
- In most cases of DKA intravenous insulin will be necessary
- In cases where ketosis is mild may be able to be managed with subcutaneous short acting insulin 1-2 hourly

7. Is an endocrinology consult necessary?

- An endocrinology consult should be sought for all cases of DKA to help ensure it does not occur again
- The type of diabetes may need to be explored or reviewed
- In this case endocrinology will need to advise when the patient is metabolically stable before surgery can proceed

Take Home Messages

- In patients who lack insulin secretory capability (T1DM, T2DM on basal-bolus regime, DM 2^o to pancreatic disease) insulin is crucial to prevent ketosis - not just to maintain glycaemic control
- Even when above patients are kept NBM, some basal insulin must be given to prevent ketosis
- When called to review hyperglycaemia always consider the possibility and determine the risk of DKA - use vital signs and bedside ketone testing to guide you
- If a type 1 diabetic is hyperglycaemic *always check for ketones*

Related Podcasts

- [The sick neonate](#)
- [The sick child](#)
- [Assessing and treating paediatric patients](#)

If you enjoyed listening to this week's podcast feel free to let us know what you think by posting your comments or suggestions in the comments box below.

If you want to listen to this episode while not connected to WiFi or the internet, you can download it. To find out more go to Apple support (<https://support.apple.com/en-us/HT201859>)